

Anatomy, a subject on which a brief volume from his pen would be very acceptable. Prof. Foster's course is on the Physiology of the Senses this term.

Among the numerous courses of demonstrations in the Cavendish Laboratory we may note those of Mr. Wilberforce on Dynamo-Electric Machines (Alternating Current Generators and Transformers).

Two lectures will be given in the Literary Schools on June 4, and June 8 at 2.15 p.m., by Dr. Francis Warner, on the Study of Mental Action and the Classification of Pupils according to their Brain Power.

LONDON.—The following appointments of Examiners in various branches of Science in the University of London were made on Wednesday, April 24 :—Prof. Hill and Dr. Larmor as Examiners in Mathematics and Natural Philosophy ; Prof. Fitzgerald and Mr. Glazebrook as Examiners in Experimental Philosophy ; Dr. Pole and Sir John Stainer as Examiners in Music ; Prof. Tilden as Examiner in Chemistry ; *Prof. H. E. Armstrong, F.R.S., as Examiner in Chemistry ; Prof. Bower and Prof. Ward as Examiners in Botany and Vegetable Physiology ; Mr. Sedgwick as Examiner in Comparative Anatomy and Zoology ; *Sydney J. Hickson as Examiner in Comparative Anatomy and Zoology ; Prof. Boyd Dawkins as Examiner in Geology and Palæontology ; *Prof. Charles Lapworth, F.R.S., as Examiner in Geology and Palæontology. The asterisks denote new appointments. The gentlemen to whose names no asterisks are prefixed held the same appointments last year.

SCIENTIFIC SERIALS.

American Journal of Science, April.—Contributions to meteorology, by Elias Loomis. In this paper, which was read before the National Academy of Sciences, November 14, 1888, the chief subjects discussed are the relations of rain areas to areas of high and low pressure. From these studies it appears generally that no great barometric depression with steep gradients ever occurs without considerable rain ; that in great rain-storms the barometric pressure usually diminishes while the rainfall increases ; that the greatest depression of the barometer generally occurs about twelve hours after the greatest rainfall ; that a great rainfall is favourable to a rapid progress of the centre of least pressure. It also appears that in Great Britain the amount of rain with a falling barometer is twice that with a rising barometer ; but this ratio diminishes rapidly eastwards, the precipitation in Central Europe being greater when the barometer is rising than when it is falling.—The sensitive flame as a means of research, by W. Le Conte Stevens. These experiments, which take as their starting-point Lord Rayleigh's memoir on "Diffraction of Sound" (Proceedings of the R. Institution, January 20, 1888), tend to show that the sensitive flame is not applicable for purposes of exact measurement, though it is much more nearly so than has been generally supposed. Without its aid it would have been impossible to establish the important analogies here shown to exist between light and sound.—The Denver Tertiary formation, by Whitman Cross. In this paper a succinct account is given of the newly determined Tertiary formation about the Denver district, Colorado, which had hitherto been assigned to the Laramie Cretaceous. Although of limited geographical extent, this formation possesses features of special importance in several respects. The vertebrate remains here occurring present some very remarkable associations, which appear to be in direct conflict with all past observations.—Events in North American Cretaceous history illustrated in the Arkansas-Texas division of the south-western region of the United States, by Robert T. Hill. Here are embodied the results of the author's investigation of the stratigraphic and palæontological conditions in the northern and eastern termination of the Texas Cretaceous, which are brought into relation with the corresponding formations in the Gulf and Western States.—The distribution of phosphorus in the Luddington Mine, Iron Mountain, Michigan, by David H. Browne. The results are here given of some 3000 analyses of ore from the Luddington Mine made during the last three years by the author while acting as chemist to the Lumberman Mining Company. Although no generalizations are attempted, these analyses tend to throw much light on one of the most difficult problems in the chemistry of iron ore—the distribution, throughout the vein, of Bessemer ore, and its relation to the formation of the deposit.—Papers were contributed by C. S. Hastings, on a general method for determining

the secondary chromatic aberration for a double telescope objective, with a description of a telescope sensibly free from this defect ; by G. Baur, on Palæohatteria, Credner, and the Proganosauria ; and by O. C. Marsh, on some new American Dinosauria, with a comparison of the principal forms of the Dinosauria of Europe and America.

Bulletin de l'Académie Royale de Belgique, March.—On the discovery of some fossil remains of mammals anterior to the diluvium at Ixelles near Brussels, by Michael Mourlon. These deposits, brought to light in August 1888, were all found at a lower level than that of the rolled Quaternary gravels, and at some points were overlain by several beds of undisturbed shingle. They include remains of the cave bear, of *Elephas antiquus*, of *Bison priscus*, *Bos primigenius*, the hare, *Equus caballus*, and a smaller equine species here described under the name of *Equus intermedius*, altogether forty four individuals, representing five known and four not yet determined species, and presenting a general resemblance to the mammalian fauna of the English forest-bed.—On the physical properties of the free surface layer of a fluid, and on the contact layer of a fluid and a solid, by G. Van der Mensbrugghe. The experiments here described lead to results opposed to the capillary theories of Laplace and Poisson ; they further show that the theory of Gauss is intimately associated with the surface tension of fluids, one leading inevitably to the other, and confirming the author's previous conclusion that the demonstrated existence of tension justifies the theory of Gauss.—Note on a theory of the secular variation of terrestrial magnetism deduced from experimental data, by Ch. Lagrange. Several arguments are advanced in support of the author's new hypothesis that the secular magnetism of the earth is due to a magnetic potential interior and not exterior to the surface of the globe. The solid globe itself is thus regarded as a magnet, or a solenoid—that is, as a magnetic body properly so called, or as a conductor traversed by circular currents.—A paper is contributed by P. De Heen on the determination of the theoretic formula expressing the variations of volume experienced by mercury with the changes of temperature.

Rendiconti del Reale Istituto Lombardo, March 28.—Influence of the digestive juices on the virus of tetanus, by Prof. G. Sormani. A series of experiments are described, which the author has carried out on rabbits, guinea-pigs, rats, and dogs, from which are drawn the following conclusions : (1) the flesh of animals dying of tetanus may be consumed with impunity ; (2) the bacillus of tetanus swallowed by carnivorous and herbivorous animals passes through the system without causing death or any special disturbance ; (3) the gastric juices of herbivorous animals neither kill, nor diminish the virulence of, the bacillus ; (4) an animal may with impunity swallow a quantity of the virus ten thousand times more than would suffice to kill if introduced by hypodermic inoculation ; (5) the facts here determined throw some doubt on the accepted theory that the effects of tetanus are due to the absorption of poisonous alkaloids derived from the bacillus.—G. Somigliana contributes a paper on differential parameters, explaining a process by which they may be formed, and demonstrating the invariability of those of the first order. Certain relations, either new or more general than those hitherto studied, are also established between the parameters of the first and second orders.

SOCIETIES AND ACADEMIES.

LONDON.

Royal Society, April 4.—"The Ferment Action of Bacteria." By T. Lauder Brunton, M.D., F.R.S., and A. Macfadyen, M.D., B.Sc.

The chief objects of this research were, (A) to discover whether microbes act on the soil upon which they grow by means of a ferment ; and (B) whether such a ferment can be isolated, and its action demonstrated on albuminoid gelatine and carbohydrates, apart from the microbes which produce it, in the same way that the ferments of the stomach and pancreas can be obtained apart from the cells by which they were originally secreted.

The microbes used were Koch's spirillum, Finkler's spirillum, a putrefactive micrococcus, scurf bacillus, and Welford milk bacillus (Klein).

The results of the inquiry were as follows :—

(1) The bacteria which liquefy gelatine do so by means of an enzyme.

- (2) This enzyme can be isolated, and its peptonizing action demonstrated, apart from the microbes which produce it.
- (3) The most active enzyme is that formed in meat broth.
- (4) Acidity hinders, alkalinity favours, its action.
- (5) The bacteria which form a peptonizing enzyme on proteid soil can also produce a diastatic enzyme on carbohydrate soil.
- (6) The action of the diastatic enzyme can be demonstrated apart from the microbes which produce it.
- (7) The diastatic enzyme has no effect on gelatine, and *vice versa*.
- (8) The microbes, for purposes of nutrition, can form a ferment adapted to the soil in which they grow.
- (9) The putrefactive micrococcus gave negative results.

Linnean Society, April 18.—Mr. Carruthers, F.R.S., President, in the chair.—In view of the approaching anniversary meeting, the following were appointed auditors:—For the Council, Dr. John Anderson and Mr. Jenner Weir; for the Fellows, Mr. T. Christy and Mr. D. Morris.—The President called attention to a valuable donation of books on fishes, including the celebrated work of Bloch, recently presented to the Society's library by Mr. Francis Day, who, he regretted to say, was lying seriously ill at Cheltenham; upon which a cordial vote of sympathy and thanks was unanimously accorded.—Mr. J. R. Jackson, Curator of the Museum, Kew Gardens, exhibited specimens illustrating the mode of collecting at Ichang, China, the varnish obtained from *Rhus vernicifera*, so largely used by the Chinese and Japanese for lacquering. He also exhibited some Chinese candles made from varnish seed-oil.—On behalf of Mr. Henry Hutton, of Kimberley, some photographs were exhibited, showing the singular parasitic growth of *Cuscuta appendiculata* on *Nicotiana glauca*.—Dr. Cogswell exhibited specimens of vegetables belonging to four different families of plants, to illustrate the symmetrical development of rootlets.—Prof. Martin Duncan exhibited, under the microscope, and made remarks upon, the *sphæridia* of an Echinoderm.—Dr. Masters gave a summary of a paper on the comparative morphology and life-history of the Coniferæ, a review of the general morphology of the order based upon the comparative examination of living specimens in various stages of development. These observations, made in various public and private "pineta," supplemented by an examination of herbarium specimens, demonstrated the utility of gardens in aid of botanical research. The mode of germination, the polymorphic foliage, its isolation or "conrescence," its internal structure, the arrangements of the buds, the direction and movements of the shoots, were all discussed. In reference to the male and female flowers, the author described their true nature, tracing them from their simplest to their most complex or most highly differentiated condition; and showed that, so far as known, the histological structure and development were essentially the same throughout the order. Various special forms, such as the needles of *Pinus*, the phylloid shoots of *Sciadopitys*, and the seed-scales of *Abietina*, were described, and their significance pointed out. The phenomenon of enation with the correlative inversion of the fibro-vascular bundles in such outgrowths was considered in relation to the light it throws upon certain contested points in the morphology of the order; the chief teratological appearances noted in the order were detailed, and their significance discussed; the various modifications were shown to be purely hereditary or partly adaptive, and dependent on permanent or intermittent arrest, excess, or perversion of growth and development, and to various correlative changes; lastly, the polymorphic forms of the so-called genus *Retinospora*, suggested that in studying them we might be watching the development and fixation of new specific types.

Chemical Society, April 4.—Dr. W. J. Russell, F.R.S., President, in the chair.—The following papers were read:—The rate of dissolution of metals in acids, by Mr. V. H. Veley. The dissolution of copper in a solution of potassium bichromate acidified with sulphuric acid was investigated as affording a case in which no gas was evolved as such. The copper was employed in the form of metallic spheres which by various mechanical devices were rolled about continuously and regularly in the acid liquid, and the products of the changes continuously removed from the immediate neighbourhood of the metal. The author finds (1) that if the temperature be varied between 21° and 41° in an arithmetical proportion the amount of chemical action varies in a geometrical proportion; (2) that if the amount of sulphuric acid be varied in an arithmetical proportion

between the limits of 41·3 and 23·5 grammes per litre, the amount of change also varies in an arithmetical proportion; and (3) that the amount of change is at first considerably increased by increase of proportion of potassium bichromate, but the effect afterwards gradually diminishes to *nil*, at which point the bichromate can be considered to be so much inert material: the amounts used varied from 22·1 to 66·3 grammes per litre.—Note on the interaction of metals and acids, by Prof. H. E. Armstrong. When a metal forming an element in a voltaic couple is dissolved, the rate of dissolution is in accordance with Ohm's law, $C = E/R$: and this should apply also to the case in which a metal is dissolved without any precaution being taken to arrange it as an element of a couple, as the action is conditioned by the formation of, and takes place within, "local circuits." The changes attending the dissolution of metals may, therefore, in a certain sense be said to be purely electrical in the first instance; yet within recent years it has been argued by various chemists that the phenomena are only in part electrical and in part chemical—whatever this may mean. The author discussed the various phases of such changes, and criticized the conclusions arrived at by Spring and Aubel and others. Referring to Mr. Veley's experiments Prof. Armstrong expressed the opinion that the results were in no way commensurate with the labour expended in obtaining them: although by introducing bichromate polarization by hydrogen had been prevented, its use had introduced complications which made the analysis of the results impossible; in fact the information likely to be obtained from such experiments was not of the kind required in the present state of chemical science. Thus the proof obtained that a copper sphere dissolved uniformly in a mixture of sulphuric acid and bichromate was but a proof of the efficiency of the stirring apparatus: such would necessarily be the case, as the values of E and R remained almost unchanged throughout the experiment owing to the relatively small proportion of the agents used up. In the course of his reply Mr. Veley mentioned that he had had occasion to verify Dr. Russell's observation that silver is not dissolved by nitric acid free from nitrous acid, to which reference had been made, and stated that in experiments with copper and nitric acid he had observed that the action took place at first more slowly, and only attained a maximum rate when a certain small amount of nitrate was formed. Prof. Armstrong remarked that this was a really important observation, proving that the dissolution of copper in nitric acid was dependent on the presence of a third substance—perhaps cupric nitrate.—A zinc mineral from a blast furnace, by Mr. J. T. Cundall.

Zoological Society, April 29.—Sixtieth Anniversary Meeting.—Prof. Flower, C.B., F.R.S., President, in the chair.—In the Report of the Council on the proceedings of the Society during the year 1888, it was stated that the number of Fellows on January 1, 1889, was 3076, showing a decrease of twenty-eight as compared with the corresponding period in 1888. The total receipts for 1888 had amounted to £24,025 10s. 8d., showing an increase of £922 15s. 2d., as compared with the previous year. The receipts from admissions to the Gardens had risen from £12,138 to £13,284. The ordinary expenditure for 1888 had been £21,439 16s. 4d., which was £2436 less than the corresponding amount for 1887. Besides this, an extraordinary expenditure of £700 had been incurred, which had brought up the total expenditure for the year to £22,139. The sum of £1000 had been employed in repayment of a temporary loan from the bankers, and a further sum of £1000 had been devoted to the diminution by that amount of the debt on the Society's freehold premises, which now stood at £7000. After deducting these payments from the income of 1888, and adding to it the balance of £1158, brought over from the previous year, a balance of £1043 was carried forward for the benefit of the present year. The usual scientific meetings had been held during the session of 1888, and a large number of valuable communications had been received upon every branch of zoology. These had been published in the annual volume of Proceedings for 1888, which contained 717 pages, illustrated by thirty-two plates. Besides this, Part 7 of the twelfth volume of the Society's quarto Transactions, illustrated by eight plates, had been issued. The volume of the "Zoological Record" for 1888, containing a summary of the work done by British and foreign zoologists in 1887, had been issued early in the present year. It had been edited by Mr. F. E. Beddard, the Prosecutor to the Society. An important event in connection with the Library during the past year had been the receipt from the

executors of the late Madame Cornély, widow of the late M. J. M. Cornély, an old and valued corresponding member of the Society, of a valuable library of zoological books. The Cornély Library consisted of about 840 volumes, of which 256 were new to the Society's Library, and many of these were rare and difficult of acquisition. In the Gardens in Regent's Park, the work during the past year had been entirely confined to repairs and renewals, which, however, had kept the staff of workmen busily engaged. The visitors to the Gardens during the year 1888 had been altogether 608,402, the corresponding number in 1887 having been 562,898. The number of animals in the Society's collection on December 31 last was 2290, of which 666 were Mammals, 1280 Birds, and 314 Reptiles. Amongst the additions during the past year nine were specially commented upon as of remarkable interest, and in most cases representing species new to the Society's collection. About thirty-one species of Mammals, seventeen of Birds, and two of Reptiles had bred in the Society's Gardens during the summer of 1888.—The Report having been adopted, the meeting proceeded to elect the new members of Council and the officers for the ensuing year. The usual ballot having been taken, it was announced that Lieut.-Colonel the Lord Abinger, C.B., Mr. Henry A. Brassey, Mr. Henry E. Dresser, Lieut.-General Sir H. B. Lumsden, K.C.S.I., and the Lord Arthur Russell, had been elected into the Council in place of the retiring members; also that Mr. Walter Morrison, M.P., elected into the Council since the last anniversary, had been re-elected in place of the late Surgeon-General L. C. Stewart (deceased); and that Prof. Flower, C.B., F.R.S., had been re-elected President; Mr. Charles Drummond, Treasurer; and Mr. Philip Lutley Sclater, F.R.S., Secretary to the Society for the ensuing year.

PARIS.

Academy of Sciences, April 15.—M. Des Cloizeaux, President, in the chair.—Researches on the thionic series, by M. Berthelot. The author describes a new method recently discovered by him, by means of which he has succeeded in measuring the heat of formation of nearly all the terms in the thionic series, such as the dithionic, trithionic, tetrathionic, and pentathionic acids. The method consists in oxidizing the salts of the thionic acids, previously dissolved, by means of bromine dissolved either in water, or, better, in bromide of potassium. For acids formed by the union of the same element combined in multiple proportions of oxygen there is in most cases a certain proportion between the liberated heat and the combined oxygen, a law already indicated by Dulong.—Experiments on putrefaction and on the formation of manures, by M. J. Reiset. Detailed descriptions are given of the critical experiments briefly referred to by the author in his recent communication on this subject. He also deals with a serious objection that has been raised against his general conclusion regarding the liberation of nitrogen during the process of putrefaction.—Movement of cyclonic storms in the various regions of the globe, by M. H. Faye. A general survey is given of the salient features of these phenomena in the North Atlantic, the Bay of Bengal, the Arabian Sea, the Indian Ocean, the China Sea, and Japan waters—that is, in the regions where they have been most carefully studied. The author insists on the essential identity of all their main characteristics; everywhere the same rapid trajectory from the equator towards one or other of the poles; the same manner of gyration narrowing towards the base round about vertical axes; the same progressive expansion frequently developing phenomena of varied segmentation far from the equator; the same independence of local climatic conditions pointing to their common origin in the upper atmospheric regions, and showing that these violent disturbances do not belong exclusively to the science of meteorology, but are the grandest terrestrial manifestations of the mechanics of fluids, acting in conformity with the simple theory already, on several occasions, announced by the author.—Observations of Barnard's new comet, March 31, made at the Observatory of Algiers with the 0.50 m. telescope for the period April 4–10, by MM. Trépied, Rambaud, and Renaux.—On the specific heat of sea water at different degrees of dilution and concentration, by MM. Thoulet and Chevallier. The measurement of the specific heat has been executed according to M. Berthelot's method with water taken on the Fécamp coast, sometimes pure, sometimes with distilled water added, and sometimes concentrated by evaporation, the determination both of the densities and of the specific heats being made at the temperature of 17°·5 C. The calculations here worked out explain the enormous influence exercised by the sea in regulating

the climates of the globe.—On the intensity of telephonic effects, by M. E. Mercadier. In continuation of his previous note (*Comptes rendus*, cviii. p. 737) the author here describes his further experiments with aluminium and copper diaphragms. The effects produced with these are found, under like conditions, to be far less intense than with iron diaphragms, the chief cause of the difference being the very slight specific magnetism of the former as compared with the latter. On the other hand, the quality of the effects produced by the aluminium and copper diaphragms is very remarkable, as they give the *timbre* of sounds and of articulate speech far better than iron.—Researches on some new metallic sulphides, by MM. Arm. Gautier and L. Hallopeau. In continuation of the already described studies (*Comptes rendus*, cvii. p. 911) on the action of carbon-di sulphide on the argillaceous earths, the authors have been led to examine its action on various metals at a red heat. The sulphides thus produced include those of iron, manganese, and the silicate of manganese described in this paper, and of nickel, chromium, lead, and aluminium, which are reserved for a future communication.—On the heat of combustion of some organic substances, by M. Ossipoff. The author has undertaken a series of experiments for the purpose of determining the heats of combustion of certain organic bodies not yet studied from the thermic standpoint. He has already completed the study of cinnaanic, atropic, and terebic acids, all of which are described in the present paper.—Bacteriological researches on the disinfection of hospitals, dwellings, &c., by gaseous substances, and especially by sulphurous acid, by MM. H. Dubief and I. Bruhl. From these experiments it appears that gaseous sulphurous acid has a destructive effect on germs contained in the air, especially when saturated by the vapour of water; that it acts mainly on the germs of bacteria, and that when employed in the pure state for a prolonged period it may prove fatal to germs even in the dry state.

April 23.—M. Des Cloizeaux, President, in the chair.—On the theory of the capture of p-riodical comets, by M. F. Tisserand. The object of this paper is to supply a rigorous proof of the theory, based on Laplace's study of Lexell's comet, that the influence of Jupiter, acting on a comet with parabolical orbit, may under certain conditions transform its course to an elliptical orbit analogous to those of the group of periodical comets. Some of the formulas here worked out agree very well for two of Tempel's comets and for that of Vico; but full details are reserved for the next issue of the *Bulletin Astronomique*.—Memoir on the ravages caused to agriculture by the cockchafer and its larva, by M. J. Reiset. The results are described of the measures that have been taken in France for the destruction of this pest since the year 1866. A detailed account is appended of its remarkable biological transformations, and instances given of its surprising vitality, surviving complete immersion in water for over four days, and when buried to a depth of 0.40 metre in the earth remaining in a state of suspended animation for 150 days.—Observations of Barnard's new comet, March 31, made at the Observatory of Paris (equatorial of the east tower), on April 19, by Mdlle. D. Klumpke; at the same Observatory (equatorial of the west tower), on April 18–19, by M. G. Bigourdan; and at the Observatory of Bordeaux with the 38 cm. equatorial, on April 20, by M. G. Rayet. During these observations the comet generally presented the appearance of a slight nebula with a nucleus of the fourteenth magnitude.—On magnetic rotatory polarization, by M. Vaschy. It is shown that M. Potier's recent hypothesis (*Comptes rendus*, March 11, 1889) on the action of the ether on ponderable matter offers a remarkably simple explanation of this phenomenon. On the other hand, it lends no support to Ampère's theory regarding molecular currents.—On the initial mode of deformation of the ellipsoidal crust of the earth, by M. A. Romieux. M. Daubrée's well-known experiments serve as the basis of a theory of the original crumpling and folding of the terrestrial crust, which is here worked out with illustrations. M. Romieux considers that, although now far removed from that initial deformation, the globe still retains many traces of its effects as here described. Thus, the Pacific Ocean, a vast and very ancient equatorial basin, acting in opposition to a continental mass with its more recent depression of the Central Mediterranean, is supposed to have been impelled by successive spasmodic pressures; three or four zones of folding against the resisting mass of the North Pole.—On the combinations of ruthenium with nitric oxide, by M. A. Joly. Continuing his investigations on this subject (see *Comptes rendus*, cvii. p. 994), the author here adds a considerable number to the

compounds of ruthenium with nitric oxide. They comprise a compound of nitric oxide with the trichloride, $\text{RuCl}_3(\text{NO}) + \text{H}_2\text{O}$, and with the sesquioxide, $\text{Ru}_2\text{O}_3(\text{NO})_2 + 2\text{H}_2\text{O}$, both remarkably stable bodies, resisting the action of water, of bases and acids, and decomposing only at a temperature above 300°C . It is suggested that analogous nitrous combinations might be formed with rhodium, and with osmium. In a future communication M. Joly proposes to show that the substances described by Fritsche and Struve, under the names of osmanomic or osmiamic acid and of osmiates, have a constitution similar to that of these compounds of ruthenium. — Researches on the richness of wheat in gluten, by MM. E. Gatellier and L. L'Hôte. A series of experiments are described by which the same wheat (white Victoria) is made to yield increasing proportions of gluten. The increase largely depends on the rotation of crops and on the proportion of nitrogen to phosphoric acid contained in the manures. — Papers were contributed by M. J. Janssen and Colonel Gouraud on Mr. Edison's improved telephone, full details of which have already appeared in the English scientific journals. The proceedings concluded with the following phonographic message sent by the President to Mr. Edison: "M. le Président et les Membres de l'Académie des Sciences adressent leurs félicitations à M. Edison pour les nouveaux perfectionnements qu'il a apportés à son phonographe, et espèrent le voir bientôt à Paris, à l'occasion de l'Exposition Universelle."

BERLIN.

Physiological Society, April 12.—Prof. du Bois-Reymond, President, in the chair.—Prof. Fritsch gave a brief account of the results he has obtained from the examination of the electrical organ of Torpedo which he has been carrying on for several years. Both Wagner and Remak had correctly made out that each plate consists of two layers, one dorsal and one ventral; that the nerves are attached to the plate from the under side, and are distributed in branches over it; and that the under surface of the plate is dotted. Very little further information as to the structure of this organ has resulted from the many investigations subsequent to those of the above-named observers. Prof. Fritsch then explained and set aside the views of the best-known observers, and summed up his own conclusions as follows. The lowest or marginal layer is composed of a layer, which is here and there discontinuous, of globules, which refract light very strongly; between these the terminal fibres of the nerves make their way into the plate. The pallisade-layer, which some previous observers had described, has an existence in the form of a number of extremely fine filaments, which stand at right angles to the plate, but inasmuch as they are so fine as to be scarcely visible, nothing can for certain be made out as to their nature. Passing further in a ventral direction, globular structures are found in the lower plate, seated upon fibres which branch dichotomously; these may perhaps be bulbous nerve-endings. Large nuclei lie between the ventral and dorsal layers. The dorsal or muscular layer contains extremely fine granules, arranged in rows at right angles to the surface. The above results were obtained by the application of the modified treatment with nitric acid. A series of photographs and drawings was exhibited in explanation of that which was described, and several preparations were shown under the microscope.—Prof. Preyer spoke on reflexes in the embryo. His researches extended over many classes of animals. As representing Mammals, guinea-pigs were chiefly used; and for reptiles, snakes; while in addition the embryos of fishes, frogs, mollusks, and other lower animals were also employed. But of all animals birds are most suitable for embryological observations, inasmuch as, with due precautions, the development of one and the same individual can be followed for a considerable time. Birds' eggs can be incubated in a warm chamber, and by removing a portion of the shell and replacing it by an unbroken piece from another egg, it becomes possible to follow the daily development of the chick and to experiment upon it. As early as the ninetieth hour of incubation, spontaneous "impulsive" movements may be observed, taking place apparently without any external stimulus as a cause, and at a time when no muscles or nerves have as yet been developed. After the occurrence of these spontaneous movements, and at the earliest on the fifth day of incubation, movements are observed to result from the application of mechanical, chemical, and electrical stimuli. In order to observe these the eggs must be allowed to cool down until all spontaneous movements have ceased. From the tenth to the

thirteenth day more complicated and reflex actions occur on the application of stimuli, as, for instance, movements of the eyelids, beak, and limbs; and if the stimuli are strong, reflex respiratory movements. These reflexes make their appearance before any ganglia have become differentiated. Prof. Preyer considered himself justified in concluding from this that ganglia are not essential for the liberation of reflex actions. He intends, on some future occasion, to give a more detailed account of these experiments, and of the conclusions which may be drawn from them. In the discussion which ensued the conclusions of the speaker were contested from many sides.

BOOKS, PAMPHLETS, and SERIALS RECEIVED.

Year Book of the Scientific and Learned Societies of Great Britain and Ireland, sixth annual issue (Griffin).—Subjects of Social Welfare: Sir Lyon Playfair (Cassell).—Biologie der Pflanzen, mit Einem Anhang: Die Historische Entwicklung der Botanik: Dr. J. Wiesner (Wien, Hölder).—The Theory of the Continuous Girder: M. A. Howe (New York).—A Vertebrate Fauna of the Outer Hebrides: J. A. Harvie-Brown and T. E. Buckley (Edinburgh, Douglas).—Challenger Report, vol. xxx. Zoology, Text and Plates (Eyre and Spottiswoode).—Animal Locomotion, 1872-85, Plates: E. Muybridge (Philadelphia).—The Metallurgy of Gold, 2nd edition: M. Eissler (Lockwood).—Himmel und Erde, Heft 8 (Berlin).—Journal of the Royal Agricultural Society of England, April (Murray).

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